McIntosh

MPI-4

MAXIMUM PERFORMANCE INDICATOR

SERVICE INFORMATION

STARTING WITH SERIAL NO. AF1001

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

PERFORMANCE LIMITS

MULTIPATH MODE OF OPERATION

Sensitivity: 100mV/cm

Frequency Response: DC to 50,000Hz (-3dB)

Input Impedance: 250kΩ

Signal Strength Polarity: Selectable positive or negative

STEREO MODE OF OPERATION

Sensitivity - L (Vertical Amp.): 1.75mV rms/cm (5mV P-P/cm)

- R (Horizontal Amp.): 1.75mV rms/cm (5mV P-P/cm)

Frequency Response: 5Hz to 50,000Hz (-3dB)

Input Impedance: 250kΩ

POWER LEVEL MODE OF OPERATION

Sensitivity: 0.1 to 1000 average watts for full scale indication (+3dB) in 9 calibrated steps.

Frequency Response: 5Hz to 100,000Hz (-3dB)

Input Impedance: 75kΩ

Calibration: For bridging 4, 8 or 16 ohm speaker loads

PREAMP LEVEL MODE OF OPERATION

Sensitivity: 15mV rms for +3dB indication

Frequency Response: 5Hz to 50kHz

Input Impedance: 250kΩ

SWEEP MODE OF OPERATION

Display modes: Left, right, or both (dual trace)

Sensitivity: 1.6mV rms/cm (4.5mV P-P/cm)

Frequency Response: 5Hz to 50kHz (-3dB)

Input Impedance: 250kΩ

Sweep Frequency: 20Hz to 20kHz in 3 Decade ranges

Sweep Expansion: .25X to 5X

Sweep Trigger: The sweep is triggered only in the presence of an input signal.

In the single trace mode it is triggered by the displayed waveform.

In the dual trace mode the trigger is selectable: Left channel, right channel, or line frequency.

LEVEL INDICATION MODE

Normal: 250µs rise time
500ms decay time

Peak: 250µs rise time
100 sec decay time

Manual reset

LOW PASS FILTER

16kHz L. P. Filter for stereo and sweep modes

19kHz and 38kHz rejected by at least 30dB

RETICLE LIGHTING

Selectable: On-Off

CRT

3 inch round tube, calibrated 5 x 6cm

1kV accelerating potential

AUTOMATIC INTENSITY CONTROL: In the absence of a horizontal signal, the intensity is reduced to prevent phosphor damage.

SEMICONDUCTOR COMPLEMENT:

2 integrated circuits

23 Transistors

10 Light emitting diodes

29 Diodes

POWER SUPPLIES

All are regulated to give equivalent performance for line voltages of 100 to 135 volts.

POWER REQUIREMENTS

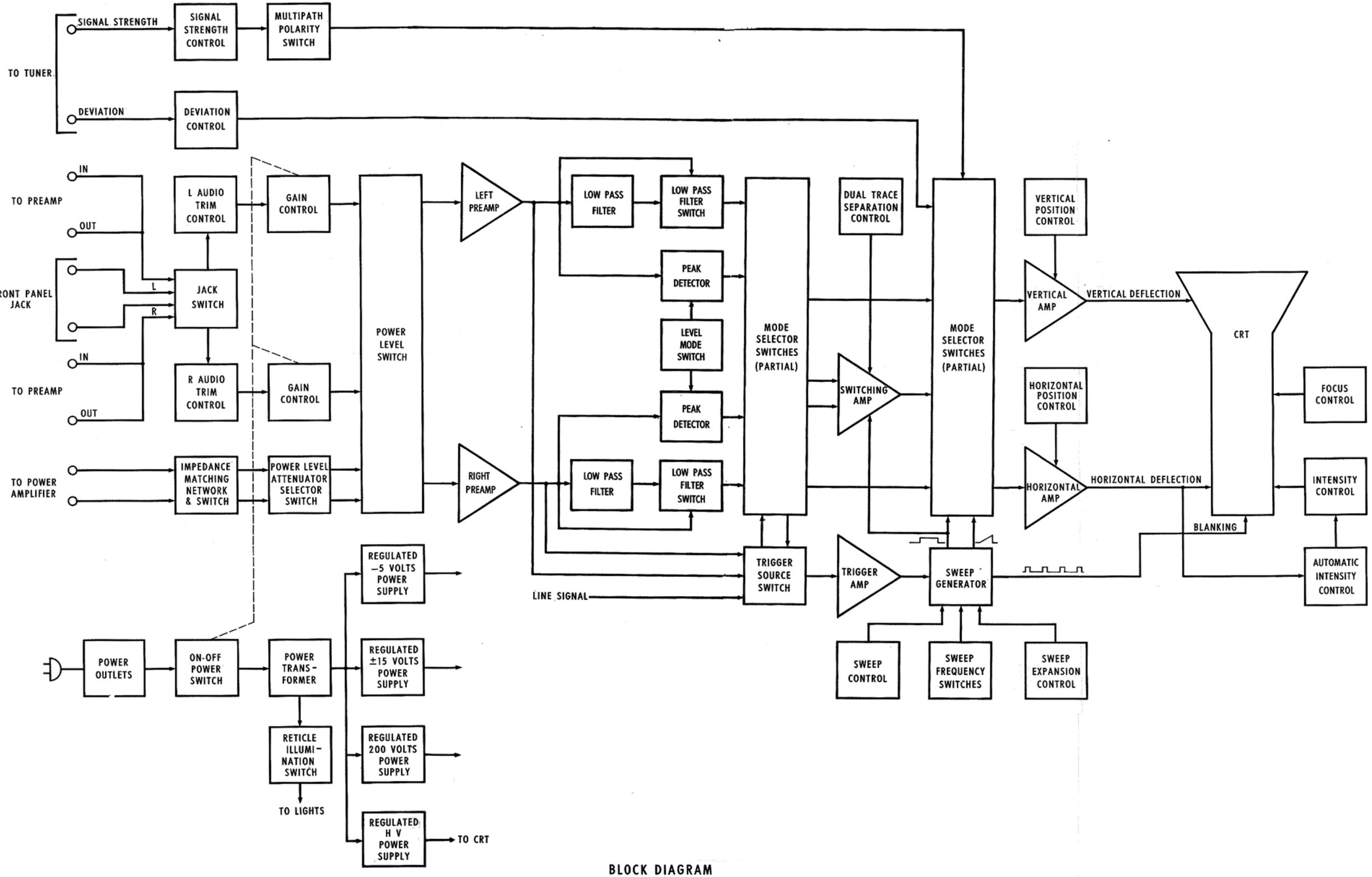
120 volts 50/60Hz 50 watts

SIZE

Front panel, 16 inches (40.65cm) wide by 5-7/16 (13.8cm) high. Chassis, 15 inches (38.1cm) wide by 5 inches (12.7cm) high by 13 inches (33.1cm) deep. Knob clearance required, 1-1/2 inches (3.85cm) in front of mounting panel.

WEIGHT

21 pounds (9.55kg) Net, 33 pounds (15kg) shipping.



BLOCK DIAGRAM

POWER AMP

TUNER
SIGNAL STRENGTH
TP1

PREAMP RIGHT AUDIO

INPUT AUDIO

PREAMP LEFT AUDIO

TUNER
DEVIATION
(TP2)

POWER AMP

S4
SECTION 3 FRONT

S4
SECTION 1 FRONT

S4
SECTION 3 REAR

S4
SECTION 1 REAR

S4
SECT 2 REAR

S4
SECT 2 FRONT

SPEAKER IMPEDANCE
½ S1

S2
MULTIPATH POLARITY

SIGNAL STRENGTH

TO MAIN PC BOARD PIN 28

TO SIO2-H PIN H3

TO SIO2-H PIN G3

TO SIO2-H PIN D3

AUDIO TRIM

GAIN

POWER LEVEL

TO SIO2-H PIN E3

POWER LEVEL INDICATOR PC BOARD 044-414

MAIN PC BOARD 044-547

IC1 133-007

SIO2 D PIN C1

SIO1

LOW PASS FILTER PC BOARD 044-556

½ S3 LOW PASS FILTER

TRACE SEPARATION

TO SIO2-D PIN E3

TO SIO2-E PIN G3

MAIN PC BOARD 044-547

S5 LEVEL MODE

NORMAL

PEAK

RESET

SIO2-F LEVEL

LOW PASS FILTER PC BOARD 044-556

½ S3 LOW PASS FILTER

TO SIO2 F PIN A3 YEL

TO SIO2 D PIN H2 BLU

TO IC-2 PIN 9

TO IC-2 PIN 12

SIO2 D PIN D3

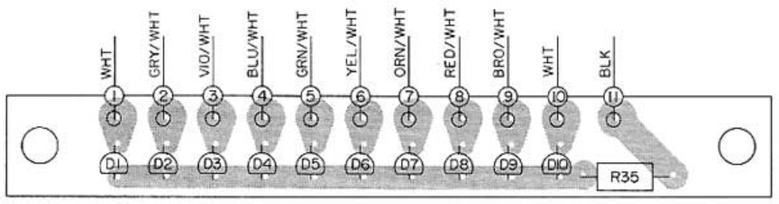
SIO1

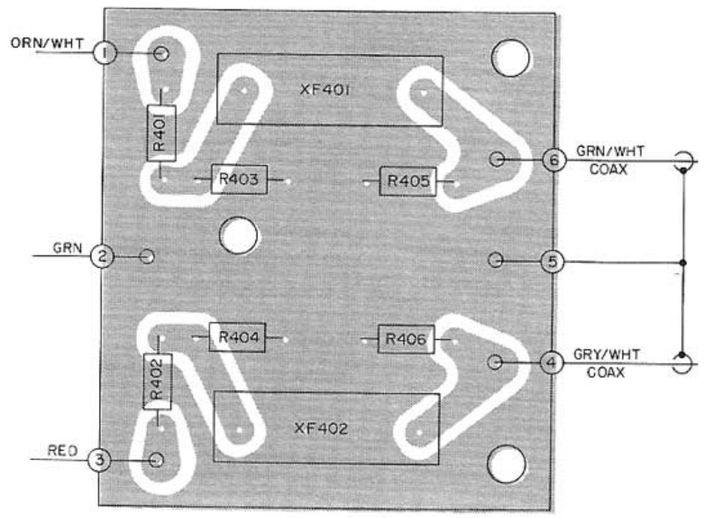
NOTE 6

INPUT & SWITCHING AMP SECTION

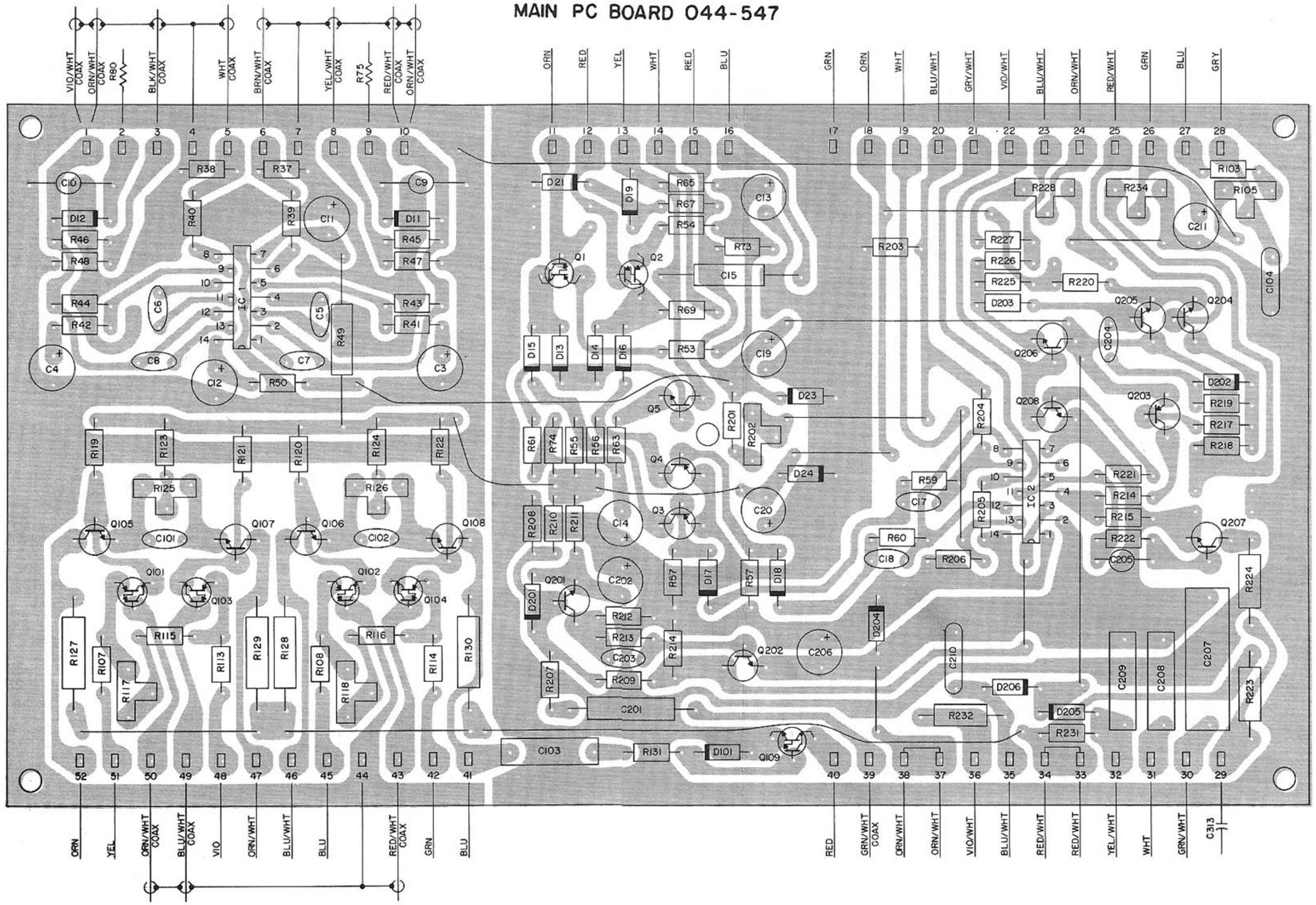
MPI-4 154-665

POWER LEVEL PC BOARD 044-444





MAIN PC BOARD 044-547



MAIN PC BOARD
044-547

BLU/WHT COAX 49
VIO 48
YEL 51
ORN/WHT 50
BLU 27
GRY 28
RED/WHT 43
ORN 42
BLU 45
44

R109 VERTICAL 5K
R111 2.2K
+15V
R107 6.8K,5%
R113 6.8K,5%
R115 1K
(VERTICAL GAIN) R117 2.5K
Q101
Q103
200V
R103 18K
C104 .1
R105 500Ω (OFFSET) ADJ
TO S2
R127 33K,1W 5%
R129 33K,1W 5%
52 ORN PIN 7 V301
47 ORN/WHT PIN 6 V301
C101 470
Q105
Q107
R125 2.5K (VERTICAL POSITION)
R119 6.2K,5%
R123 1K
R121 6.2K,5%
-15V

R110 HORIZONTAL 5K
R108 6.8K,5%
R114 6.8K,5%
R116 470Ω
(HORIZONTAL GAIN) R118 1K
Q102
Q104
R128 33K,1W
R130 33K,1W,5%
46 BLU/WHT PIN 9 V301
40 RED TO LDR NETWORK
NOTE 6
Q109
D101
R131 1.2M
C103 .005
NOTE 7
41 BLU PIN 10 V301
C102 680
Q106
Q108
R126 2.5K (HORIZONTAL POSITION)
R120 6.2K,5%
R124 1K
R122 6.2K,5%

R71 PIN 19 R229 PIN 16 PIN 21 PIN 14 PIN 20 PIN 24 PIN 12 TO S5 PIN 11 TO S5 TO S3 TO S3 TO R28 TO S2 TO S2

R101 82K R102 82K R133 82K R134 82K

S101 S301 PIN 1 LAMP PIN 33 TO S102A PIN 10 PWR SUP B

PIN 25 PIN 13 PIN 22 PIN 32 +15V TO S2

PIN 10 LAMP PIN 26 LAMP LAMP LAMP

S102D L — DUAL TRACE — S102E R
S102F LEVEL
S102G STEREO
S102H MP

NOTE 6
NOTE 7

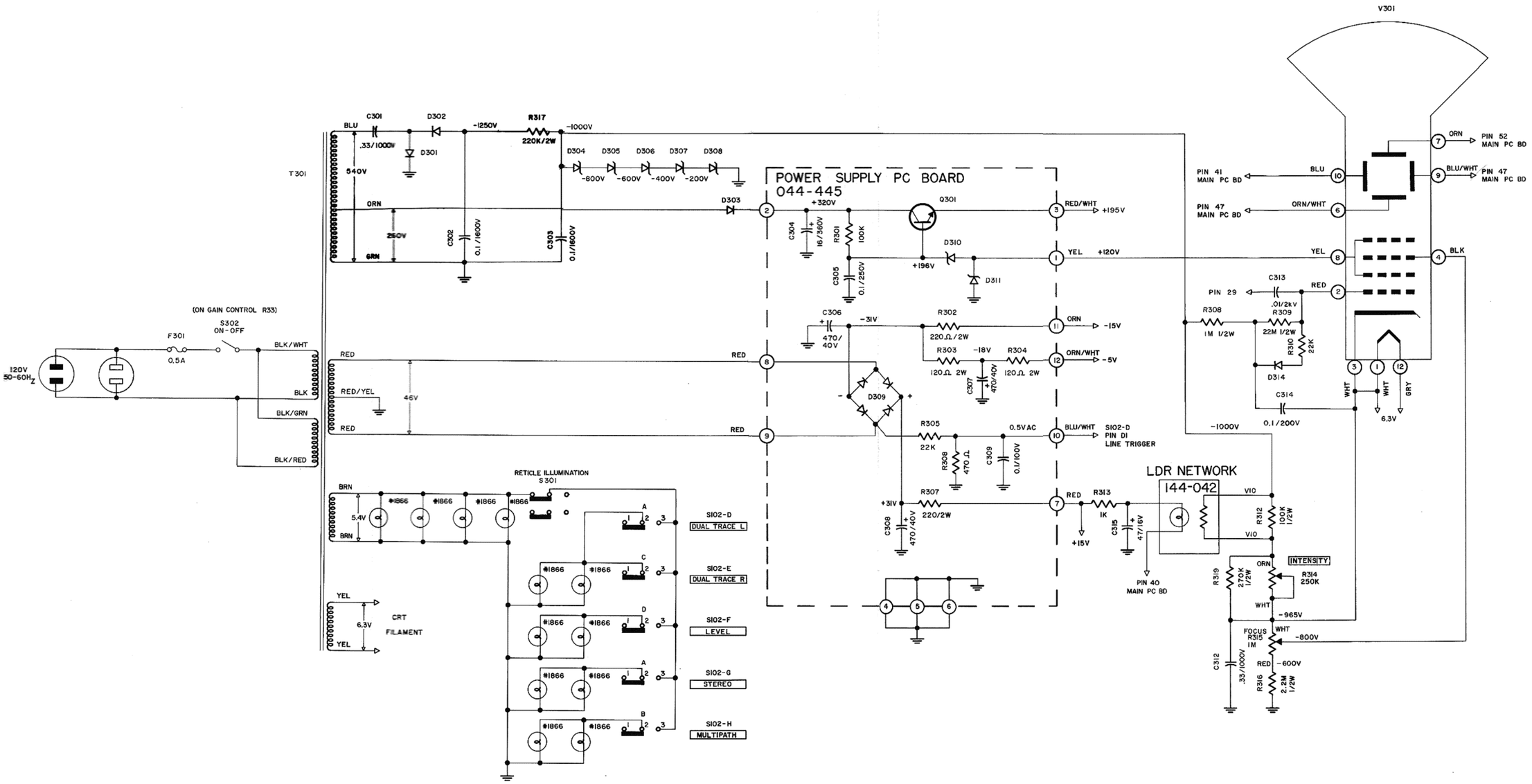
CRT AMP SECTION
MPI-4 154-664

MAIN PC BOARD
044-547

SWEEP SECTION

MPI-4

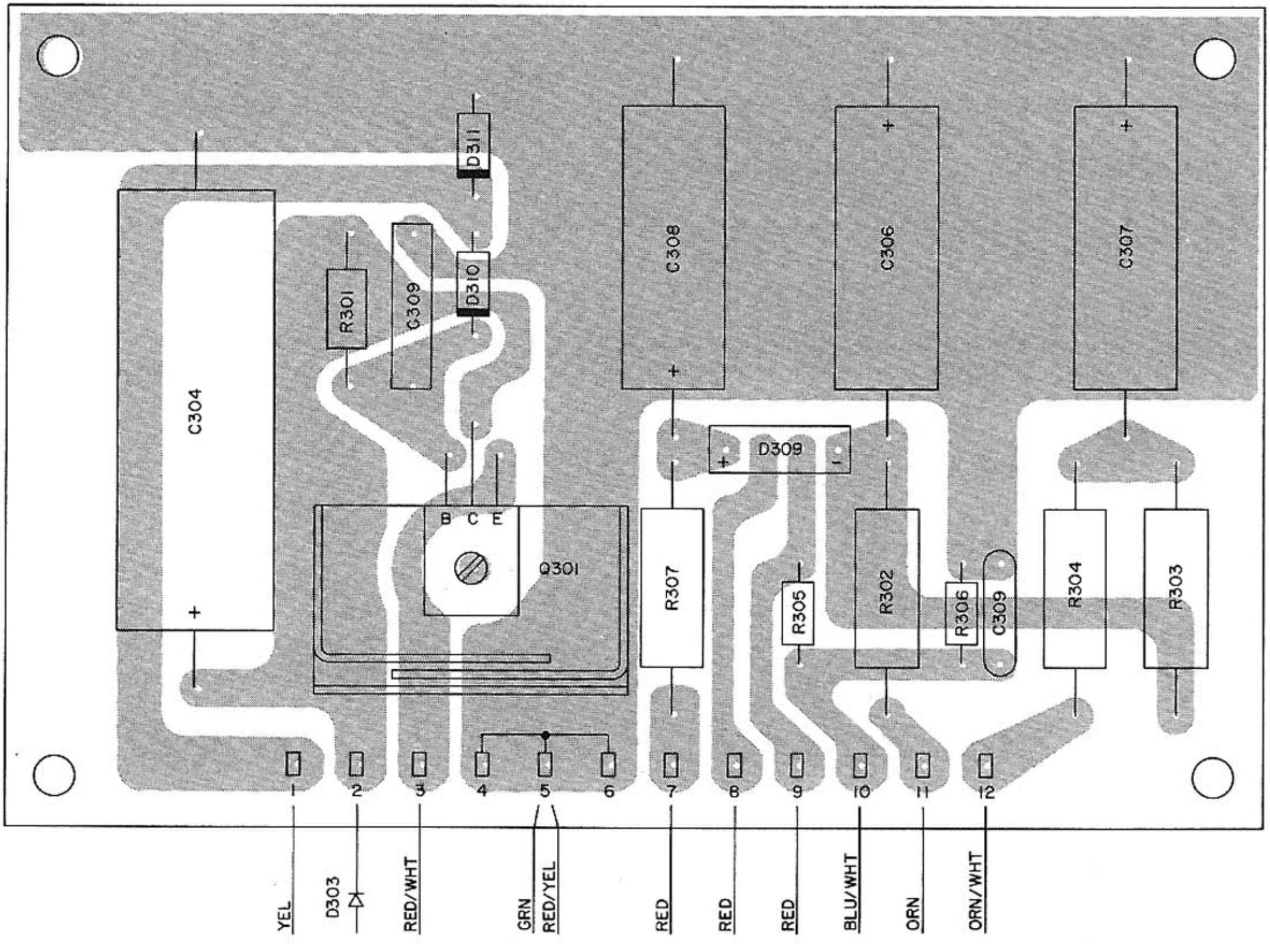
154-663



POWER SUPPLY SECTION

MPI-4 154-600

POWER SUPPLY PC BOARD 044-445



ALIGNMENT INSTRUCTIONS

Vertical Position: (R125)
STEREO With the front panel verticle control in the middle of its range adjust R125 so that the spot is located in the center of the reticle. (Fig. 1)

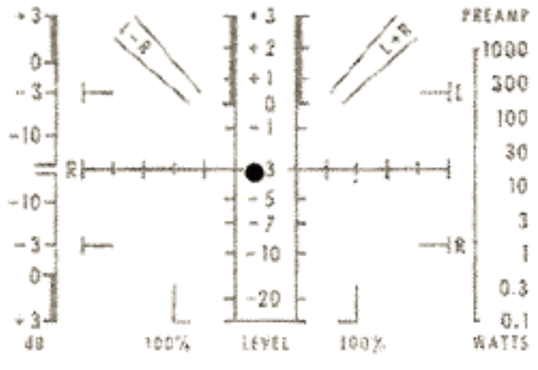


FIG. 1

Horizontal Position: (R126)
STEREO With the front panel horizontal control in the middle of its range adjust R126 so that the spot is located in the center of the reticle. (Fig. 1)

"Level" Horizontal Position: (R202)
LEVEL Adjust R202 so that the two level lines are equally spaced about the center. (Fig. 2)

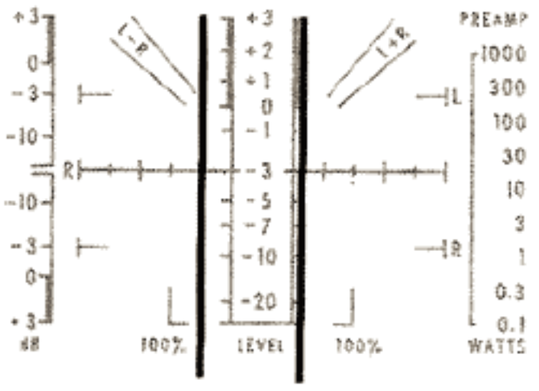


FIG. 2

Horizontal Gain: (R118)
LEVEL Adjust R118 so that the two level lines are located outside the calibration lines and inside the first marks on the Horizontal scale. (R126 may have to be readjusted to bring the spot to the center again) (Fig. 2)

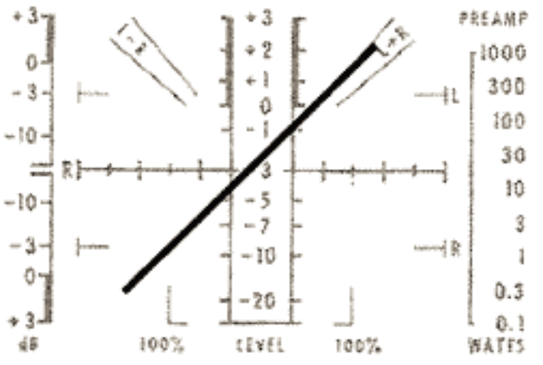


FIG. 3

Vertical Gain: (R117)
STEREO For a monophonic input adjust R117 so that the diagonal falls between the "L+R" limit lines. If the preamp input is used, it is best to have both the trim controls and the gain control fully clockwise. (R125 may have to be readjusted to bring the spot to the center again) (Fig. 3)

Offset Adjustment: (R105)
LEVEL With no input and the level mode in its "normal" position adjust R105 so that the tops of the two level lines are even with the bottom of the level scale. (This control also determines the offset for the multipath). (Fig. 4)

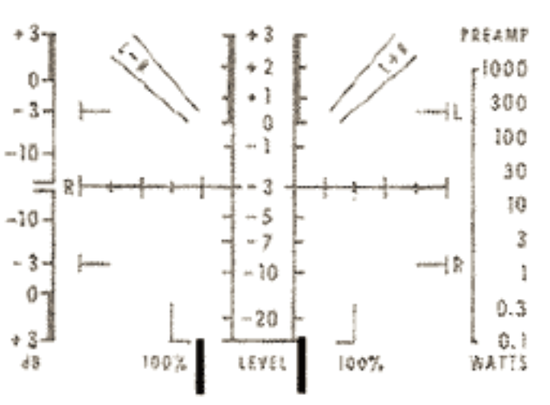


FIG. 4

Column Height: (R228)
LEVEL With the input over driven adjust R228 so that the tops of the two level lines are even with the +3 mark on the level scale. (R105 may have to be readjusted) (Fig. 5)

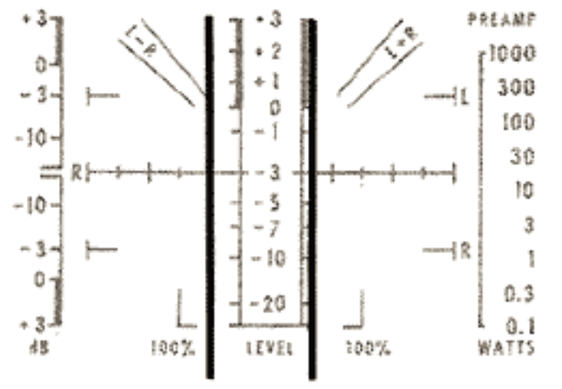


FIG. 5

Sweep End: (R234)
DUAL TRACE
L R With the trigger set to "line" and no input, set the sweep expansion control (level set panel) so that the sweep starts at the left boundary, then adjust R234 so that the sweep stops at the right boundary. (Fig. 6)

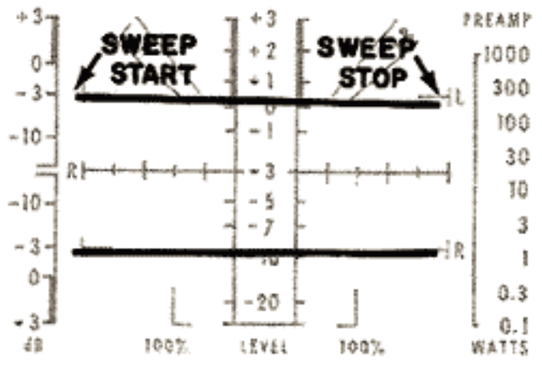
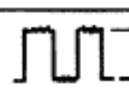
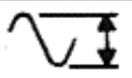
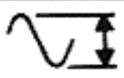
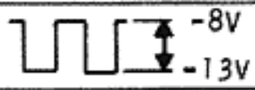
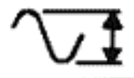
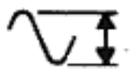
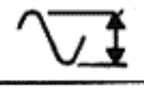
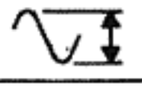
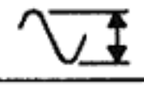
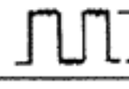
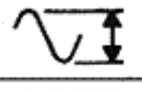
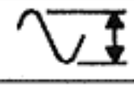
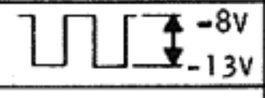
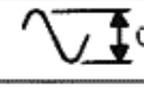
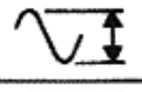
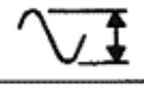
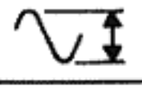
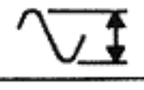
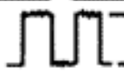
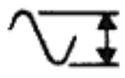
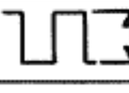
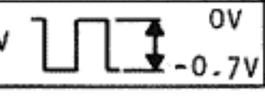
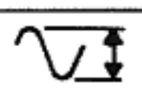
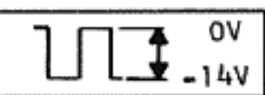
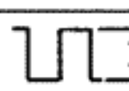
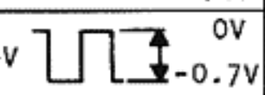
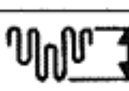
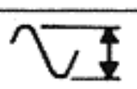
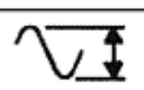
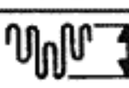
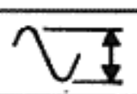
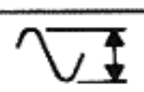
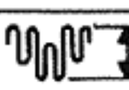
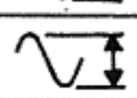
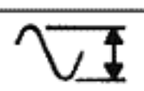
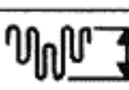
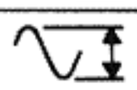
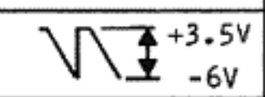


FIG. 6

MAIN PC BOARD

PINS 1 THRU 10 SEE SCHEMATIC

PIN	DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
11	0V 0.6V			6.5V	0V 0.6V	
12	0V 0.6V			6.5V	0V 0.6V	
13	-0V 0.8V	0V 0.6V		7.5V	0V 0.6V	
14	5V	-12V	4V	-10V	-4V	-12V
15	+15V					
16	-0V 0.8V	0V 0.6V		0 - 10V	0V 0.6V	
17	0V GND					
18	-15V					
19	0V	-5V	0V			
20	0V 0.15V	-0.07V	+0.07V	0V 0.15V	0V	
21	0V		-5V	0V		
22	10V -5V				-5V	
23	2V -2V				-2V	
24	0.4V -0.3V				-0.3V	
25	6V			7V	6V	
26	6V					
27	0V		15V	0V	+15V / -15V	
28	0V		0.26V	0V	+0.26V / -0.26V	
29	195V 200V 125V		160V 200V 125V	125V		
30	0.5V +7V -5V		+15V	-5V		
31	0V - IF 200-2K BUTTON NOT PRESSED OTHERWISE SIMILAR TO PIN 30					
32	+15V		-1.8V +8V -5V	+15V		
33	+200V					
34	+200V					
35	0.5V +7V -5V		+15V	-5V		
36	200V FOR SWEEP CONTROL CW 20V FOR SWEEP CONTROL CCW					
37	-5V					
38	-5V					
39	0V 15V		0V 1.5V	0V		
40	5V 10V				15V	
41	120V 90V		120V 22V	120V 90V	120V	
42	11V (DEPENDENT ON HORIZONTAL CONTROL [10V - 15V])					
43	0V 0.5V		0V 0.15V	0.0V 0.6V	0V	
44	0V GND					
45	11V (DEPENDENT ON HORIZONTAL CONTROL [10V - 15V])					
46	120V 100V		120V 22V	120V 100V	120V	
47	110V 80V	110V 60V		140V 50V	110V 50V	130V
48	12V (DEPENDENT ON VERTICAL CONTROL [11V - 15V])					
49	0V		0.2V	0V	0V (-MP POLARITY) 0.2V (+MP POLARITY)	
50	0V 0.7V	0V 0.6V		-0.1V 0.5V	0V 0.5V	-0.2V (-MP POLARITY) 0V (+MP POLARITY)
51	12V (DEPENDENT ON VERTICAL CONTROL [12V - 15V])					
52	110V 70V	110V 60V		80V 50V	110V 50V	90V

TSTR		DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
Q1	C	-8.4V  -4V -12V	-4.3V  0.4V	-12V  0.1V	 -8V -13V	-4.3V OR -12.3V  0.1V OR 0.4V	
	B	0V  0.6V			6.5V	0V  0.6V	
	E	1.1V  0.6V			7.3V	1.1V  0.6V	
Q2	C	 -4V -12V	-12.3V  0.1V	-4.3V  0.4V	 -8V -13V	-4.3V OR -12.3V  0.1V OR 0.4V	
	B	0V  0.6V			6.5V	0V  0.6V	
	E	1.1V  0.6V			7.3V	1.1V  0.6V	
Q3	C	-6.5V  0V -13V	-0.2V	-13V  0.1V	-7V 0V -14V	0V OR -13V	
	B	-0.4V  0V -0.7V	-0.7V	0V	-0.4V  0V -0.7V	0V OR -0.7V	
	E	0V GND					
Q4	C	-6.5V 0V -13V	-13V  0.1V	-0.2V	-7V  0V -14V	0V OR -13V	
	B	0.4V  0V -0.7V	0V	-0.7V	-0.4V  0V -0.7V	0V OR -0.7V	
	E	0V GND					
Q5	C	-0V  0.8V	0V  0.6V		7.5V	0V  0.6V	
	B	-5V  0.5V	-5V  0.4V		-9.5V	-5V  0.4V	
	E	-5.7V  0.5V	-5.7V  0.4V		-10.2V	-5.7V  0.4V	
Q101	C	-5V  3.5V	-5V  2.5V		-4V  +3.5V -6V	-5V 2.5V	-4.5V
	B	0V 0.7V	0V 0.6V		-0.1V 0.5V	0V 0.5V	-0.2V(-MP POLARITY) 0V (+MP POLARITY)
	E	1.1V 0.8V	1.1V 0.6V		1V 0.5V	1.1V 0.5V	1.1V
Q102	C	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	B	0V GND					
	E	1.1V 0.03V			1.1V 0.01V	1.1V 0.03V	1.1V
Q103	C	-5.3V 3.5V	-5.3V 2.5V		-6.5V 2V	-5.3V 2V	-6V
	B	0V	0V	0V	0.2V	0V	0V (-MP POLARITY) 0.2V(+MP POLARITY)
	E	1.1V 0.03V	1.1V 0.02V		1.1V 0.02V	1.1V 0.02V	1.1V
Q104	C	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	B	0V 0.5V			0V 0.15V	0.0V 0.6V	0V
	E	1.1V 0.5V			1.1V 0.15V	1.1V 0.5V	1.1V
Q105	C	110V 70V	110V 60V		80V 50V	110V 50V	90V
	B	-5V 3.5V	-5V 2.5V		-4V 3.5V -6V	-5V 2.5V	-4.5V
	E	-5.7V 3.5V	-5.7V 2.5V		-4.5V 2.5V	-5.7V 2.5V	-5V
Q106	C	120V 100V			120V 22V	120V 100V	120V
	B	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	E	-5.8V 3.5V			-5.8V 1V	-5.8V 4V	-5.8V
Q107	C	110V 80V	110V 60V		140V 50V	110V 50V	130V
	B	-5.3V 3.5V	-5.3V 2.5V		-6.5V 2V	-5.3V 4V	-6V
	E	-5.8V 3V	-5.8V 2V		-7V 2V	-5.8V 2V	-6.5V
Q108	C	120V 90V			120V 22V	120V 90V	120V
	B	-5.3V 4V			-5.3V 1V	-5.3V 4V	-5.3V
	E	-5.8V 4V			-5.8V 1V	-5.8V 4V	-5.8V
Q109	C	5V			10V		15V
	B	0.4V +1.5V -0.5V			0.4V +1.5V -0.5V	0.4V +1.5V -0.5V	0V
	E	0V GND					

TSTR		DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
Q201	C	-6V 8V				-7.5V	
	B	-10V 1.5V			-10V 1V	-7V	
	E	-10V 0.01V			-10V 0.1V	-7.6V	
Q202	C	0V -5V			60Hz 0V -5V	0V	
	B	-7V 6V				-7.5V	
	E	-5V					
Q203	C	+14V +15V -5V			14.5V +15V -5V	+15V	
	B	14.5V 0.8V				14.5V	
	E	+15V					
Q204	C	12V 3V				12V	
	B	5.5V			7.2V	5.5V	
	E	5V 2.5V			6.5V 2.5V	5V	
Q205	C	+15V					
	B	3V 5V				0V	
	E	5V 2.5V			6.5V 2.5V	5V	
Q206	C	+15V					
	B	+10V -5V				-5V	
	E	0V +12V			-2.3V 14V	-5.5V	
Q207	C	185V +196V -5V			95V +196V -5V	-5V	
	B	-5V 0.5V			-4.6V 0.5V	-4.4V	
	E	-5V					
Q208	C	+10V -5V				-5V	
	B	-5V 0.6V			-4.6V 0.6V	-4.3V	
	E	-5V					

IC-2	DUAL TRACE	L SWEEP	R SWEEP	LEVEL	STEREO	MULTIPATH
1	0V					
2	-5V					
3	0V -5V			60Hz 0V -5V	0V	
4	-2V -5V				-2V	
5	-2V -5V			-2V -5V	-2V	
6	0V -5V			0V -5V	-5V	
7	-5V					
8	0V -5V	0V	-5V	0V -5V	-5V OR 0V	
9	0V -5V	-5V	0V	0V -5V	-5V OR 0V	
10	0V		-5V	0V		
11	-2V -5V			-2V -5V	-2V	
12	0V -5V	0V	-5V	0V -5V	-5V OR 0V	
13	0V	-5V	0V			
14	0V					

1. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; Capacitance values smaller then 1 are in microfarads (µF); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries (µH).

2. Printed circuit board components are outlined on the schematics by dotted lines. The circled numbers around the dotted lines correspond to the numbers on the PC Board layouts.

3. The terminal numbering of rotary switches is for reference only.

4. All voltages indicated are measured under the following conditions:

   a. Use of an 11 megohm input impedance VTVM.

   b. Tuner Input: None

   c. Preamp Input: 10 MV rms, 1kHz (Left & Right)

   d. Power Amp Input: None

   e. Controls At:

Sweep:	Fully clockwise	Filter:	Out
Vertical:	Center	Trigger Source:	Left
Horizontal:	Center	Trace Separation:	Normal
Intensity:	Normal	Sweep Expansion:	Normal (X1)
Power Level:	Preamp	Trim:	Fully clockwise
Gain:	Fully clockwise	Sweep Frequency:	20 - 200
Level Mode:	Normal		

Mode Selector: Refer to "Voltage and Waveform" chart for voltages at PC Board, transistor and IC pins. Voltages change with the positions of the mode selector pushbutton switch. Voltages that are not affected by the mode selector are on the schematic diagram.

All voltages are D.C. except those shown with an A.C. signal. If a pin has both a D.C. voltage and an A.C. signal the D.C. voltage is written first.

5. The voltages shown are typical and will not necessarily be the same for every unit. Variations of ±25% are not unusual.

6. In units with Serial No's below AF2175 R57 & R58 are 1K; R131 is 220K and C103 is .022µF.

7. In units with Serial No's below AF1588 C103 is .22µF; R201 is 33K and R202 is 500K.

REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory, Inc.
Customer Service Department
2 Chambers Street
Binghamton, New York 13903
(telephone 607-723-3512)

CAPACITORS

Symbol Number	Description			Part Number
C1,2	Mylar	.22µF	200V	064-043
C3,4	Elect	47µF	16V	066-182
C9,10	Tant Elect	1µF	50V	066-242
C11,12	Elect	100µF	16V	066-226
C13,14	Elect	47µF	16V	066-182
C15	Elect	10µF	50V	066-222
C103	Mylar	.22µF	250V	064-068
C201	Elect	10µF	50V	066-222
C202	Elect	100µF	16V	066-226
C206	Elect	470µF	6V	066-197
C207	Mylar	1µF	250V	064-088
C208,209	Mylar	.1µF	250V	064-067
C210	Mylar	.01µF	250V	064-101
C211	Elect	10µF	50V	066-221
C301	Paper	.33µF	1000V	064-109
C302,303	Paper	.1µF	1600V	064-110
C304	Elect	16µF	350V	066-196
C305	Mylar	.1µF	250V	064-067
C306,307	Elect	470µF	40V	066-134
C308	Elect	470µF	40V	066-134
C310,311	Elect	100µF	16V	066-226
C312	Paper	.33µF	1000V	064-109
C314	Mylar	.1µF	200V	064-067
C315	Elect	47µF	16V	066-182

DIODES

D1,2	Light emitting diode		070-056
D3,4	Light emitting diode		070-056
D5,6	Light emitting diode		070-056
D7,8	Light emitting diode		070-056
D9,10	Light emitting diode		070-056
D11,12	Si. signal diode		070-047
D13,14	Si. signal diode		070-047
D15,16	Si. signal diode		070-047
D17,18	Si. signal diode		070-047
D19	Si. signal diode		070-047
D21	Zener diode	10V	070-024
D101	Si. signal diode		070-047
D201,202	Si. signal diode		070-047
D203	Si. signal diode		070-047
D204	Zener diode	4.7V	070-057
D205,206	Si. signal diode		070-047
D301,302	Diode	2000V	070-058
D303	Diode	800V	070-059
D302,305	Zener diode	200V	070-060
D306,307	Zener diode	200V	070-060
D308	Zener diode	200V	070-060
D309	Bridge Rectifier		070-044
D310	Zener diode	75V	070-025
D311	Zener diode	120V	070-062
D312,313	Zener diode	15V	070-061
D314	Si. signal diode		070-047

TRANSISTORS

Q1,2	Si. PNP transistor	132-100
Q3,4	Si. PNP transistor	132-096
Q5	Si. NPN transistor	132-092
Q101,102	Si. PNP transistor	132-100
Q103,104	Si. PNP transistor	132-100
Q105,106	Si. NPN transistor	132-102
Q107,108	Si. NPN transistor	132-102
Q109	Si. NPN transistor	132-090
Q201,202	Si. NPN transistor	132-092
Q203	Si. PNP transistor	132-096
Q204,205	Si. NPN transistor	132-092
Q206	Si. NPN transistor	132-092
Q207	Si. NPN transistor	132-102
Q208	Si. NPN transistor	132-042
Q301	Si. NPN transistor	132-102

FUSES

F301	Fuse	1/2A	089-009

POTENTIOMETERS

R27	Signal strength control	134-252
R28	Deviation control	134-252
R29	Audio trim control	134-252
R30	Audio trim control	134-252
R33	Gain control	134-251

R71	Trace separation control	134-219
R109	Vertical control	134-244
R110	Horizontal control	134-244
R233	Sweep control	134-250
R229	Sweep expansion control	134-219
R314	Intensity control	134-248
R315	Focus control	134-249

SWITCHES

S1	Speaker impedance	148-033
S2	Multipath polarity	148-032
S3	Lo Pass filter	148-031
S4	Power level switch	146-161
S5	Level mode	148-034
S101	Trigger source	148-033
S102	Mode selector	150-011
S301	Reticle illumination	148-031

TRANSFORMERS

T301	Power transformer	159-091

TUBES

V301	Cathode ray tube	165-062

INTEGRATED CIRCUITS

IC1	Integrated circuit	133-007
IC2	Integrated circuit	133-008

LAMPS

#1866	Front panel	058-014
#1866	Reticle illumination	058-014

FRONT PANEL & TRIM

	Front panel	044-439
	Front panel end caps	018-160
	Sweep knob	044-429
	Horizontal knob	044-429
	Vertical knob	044-429
	Intensity knob	044-429
	Power level knob	044-429
	Gain knob	044-430
	Focus knob	090-122
	trace separation knob	090-121
	Sweep expansion knob	090-121
	Signal strength knob	090-121
	Audio trim knob	090-121
	Pushbutton	017-128

MISCELLANEOUS ITEMS

	Plastic feet	017-156
	Shipping carton	044-538
	Push terminal strip	074-030
	Owners manual	038-788
	AC line cord	170-021
	Fuse holder	170-033
	Audio cable	176-135

MOUNTING SYSTEM

	Shelf bracket (right)	043-622
	Shelf bracket (left)	043-623
	Mounting template #100	038-179
	Hardware package	044-440

MODULES

	LDR Network	144-042

15C0923S7-M5923-2

SCHEMATIC PART NO. 038-923